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SPECIFIC CHARACTER OF MAGNETIC FIELD AND DEVELOPMENT OF UNDERWATER--ETC(U)  
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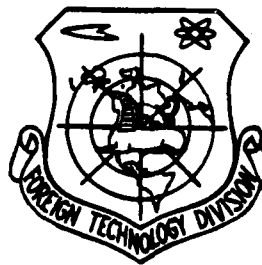
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SPECIFIC CHARACTER OF MAGNETIC FIELD AND DEVELOPMENT  
OF UNDERWATER RIDGES OF ARCTIC BASIN

by

A. M. Karasik, R. M. Dementitskaya, V. G. Shelovanov



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# U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<b><i>А а</i></b>	A, a	Р р	<b><i>Р р</i></b>	R, r
Б б	<b><i>Б б</i></b>	B, b	С с	<b><i>С с</i></b>	S, s
В в	<b><i>В в</i></b>	V, v	Т т	<b><i>Т т</i></b>	T, t
Г г	<b><i>Г г</i></b>	G, g	У у	<b><i>У у</i></b>	U, u
Д д	<b><i>Д д</i></b>	D, d	Ф ф	<b><i>Ф ф</i></b>	F, f
Е е	<b><i>Е е</i></b>	Ye, ye; E, e*	Х х	<b><i>Х х</i></b>	Kh, kh
Ж ж	<b><i>Ж ж</i></b>	Zh, zh	Ц ц	<b><i>Ц ц</i></b>	Ts, ts
З з	<b><i>З з</i></b>	Z, z	Ч ч	<b><i>Ч ч</i></b>	Ch, ch
И и	<b><i>И и</i></b>	I, i	Ш ш	<b><i>Ш ш</i></b>	Sh, sh
Й й	<b><i>Й й</i></b>	Y, y	Щ щ	<b><i>Щ щ</i></b>	Shch, shch
К к	<b><i>К к</i></b>	K, k	Ъ ъ	<b><i>Ъ ъ</i></b>	"
Л л	<b><i>Л л</i></b>	L, l	Ы ы	<b><i>Ы ы</i></b>	Y, y
М м	<b><i>М м</i></b>	M, m	Ь ь	<b><i>Ь ь</i></b>	'
Н н	<b><i>Н н</i></b>	N, n	Э э	<b><i>Э э</i></b>	E, e
О о	<b><i>О о</i></b>	O, o	Ю ю	<b><i>Ю ю</i></b>	Yu, yu
П п	<b><i>П п</i></b>	P, p	Я я	<b><i>Я я</i></b>	Ya, ya

\*ye initially, after vowels, and after ъ, ь; e elsewhere.  
When written as ë in Russian, transliterate as yë or ë.

## RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sin <sup>-1</sup>
cos	cos	ch	cosh	arc ch	cos <sup>-1</sup>
tg	tan	th	tanh	arc th	tan <sup>-1</sup>
ctg	cot	cth	coth	arc cth	coth <sup>-1</sup>
sec	sec	sch	sech	arc sch	sech <sup>-1</sup>
cosec	csc	csch	csch	arc csch	csch <sup>-1</sup>

Russian	English
rot	curl
lg	log

Accession For	NTIS GRA&I
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## SPECIFIC CHARACTER OF MAGNETIC FIELD AND DEVELOPMENT OF UNDERWATER RIDGES OF ARCTIC BASIN.

A. M. Karasik, R. M. Dement'skaya, V. G. Shel'evanov (NIIGA).

In recent years with the participation of the scientific research institute of geology of Arctic are carried out systematic aeromagnetic photographings of the Eurasian part of the Arctic basin and adjacent to it from the south shelf seas. The use/application of proton magnetometers, high-precision methods of joining and single method of operation contributed to obtaining the objective picture of anomalous field on the significant part of Arctic Ocean and, in particular, on underwater ridges of Hakkel, Lomonosov and Mendeleev with the adjacent to them deep-water basins. Therefore it became possible to come to light/detect/expose the special features/peculiarities of anomalous magnetic field and some features of the development of underwater ridges of Arctic Ocean.

Up to now Eurasian basin remains the sole region of world ocean

whose magnetic field is systematically studied all over width of typically ocean basin (Demenitskaya, Karasik, 1966). According to its basic signs/criteria the magnetic field of Eurasian basin is uniform according to the structure with the field of mid-Oceanian ridges/spines (Karasik, 1968), but it is at the same time characterized by the number of the special features/peculiarities:

1. The anomalous field of the studied part of the ridge/spine of Hakkel and troughs of Nansen and Arundsen is everywhere uniform and sufficiently confidently is disengaged the field of a Barents-Kara shelf and Lomonosov ridge/spine on the boundaries which as a whole coincide well with the morphological boundaries of Eurasian basin. At the same time the intensity of the anomalies noticeably lower than that which it would be possible to expect at the usually permissible values of the intensity of magnetization of the species/rocks of sources (Vine, 1966), taking into account the high latitude position of region. Apparently, this special feature/peculiarity is characteristic to all now active median ridges/spines of Arctic Ocean, which lie north of a Jan-Mayensk zone of fault (Ostenso, 1968). The lowered/reduced intensity of field logical to connect either with the weak intensity of magnetization of species/rocks or with small thickness of magnetically active layer, or with the large depth of its occurrence. The seismic data about the large power/thickness of precipitation testify in favor of latter/last

assumption, and the calculations of the intensity of magnetization of species/rocks - in favor of the first.

2. Confinement of local isometric magnetic anomalies of different sign to separate large/coarse underwater mountains attests to the fact that sign ambiguity of anomalous field is caused by different sign of remanence of species/rocks. However, due to the general/common/total lowered/reduced intensity of field the contrast of the anomalies above the oppositely magnetized bodies is weakened. This fact substantially impedes selection of the inversion magnetically active layer in the Eurasian basin. Nevertheless the comparison of empirical and model fields leads to the conclusion about the average speed of the growth of the bottom 1.1 cm/yr for the latter of 10 mln. summers/years on Hakkel ridge/spine to the north from the Earth of Franz-Joseph (Karasik, 1968). The low contrast of the anomalies of different sign in combination with other factors leads to the fact that map/chart/card ( $\Delta T$ )<sub>a</sub> of Eurasian basin, represented in the black-white version (Fig. 1), is characterized by the considerably smaller regularity of courses/strikes, than the magnetic cards of some other median ridges/spines. However, the visible regularity of field is amplified on the map/chart/card of the axes of anomalies, based on the interroute correlation of anomalies.

3. In magnetic field of Eurasian basin can be confidently

isolated three zones - axial and two lateral, boundaries between which are arranged/located in limits of basins. Enhanced intensity and reduced wavelength of anomalies in the axial zone is connected with uplift of the magnetically active layer which is morphologically expressed by Hakkel ridge/spine, and the noncoincidence of magnetic boundaries with the morphological ones finds explanation in the leveling role of great sedimentary thickness, which is revealed according to seismic data by Yu. G. Kiselev.

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Thus, the zoning of anomalous magnetic field in Eurasian of basin reflects faster its tectonic, rather than morphological zonality.

4. During wide development of transverse disturbances/breakdowns of structure of field, connected with faults of oceanic bottom, in studied part of Eurasian basin it is not discovered disturbances/breakdowns, on which amplitude of displacement of anomalies would exceed 25 km. Predominate the disturbances/breakdowns, isolated on the basis of the partial rearrangement of the structure of field. In the relief of the bottom to them correspond the pairs (less - chains/networks) of underwater mountains, which are located along the different sides of rifled valley. The merging feet or the slopes of these mountains form the

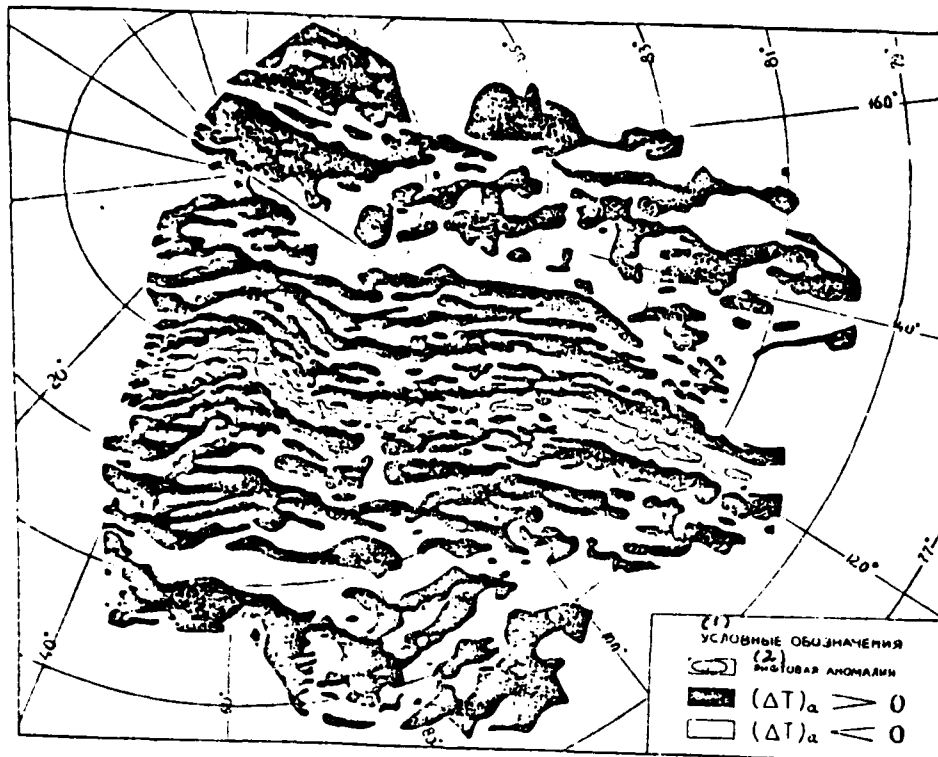


cross connections of riffling valley. Analogous phenomena are discovered on the ridge of the North Atlantic ridge/spine in the region  $45^{\circ}$  N (Loncarevic and oth., 1966). In this region as in the axial zone of Haeckel ridge/spine, the ratio of average distance between the faults to the average/mean width of anomalies close to four.

The rearrangement of the structure of field during the disturbances/breakdowns is reduced to certain redistribution of the position of the axes of anomalies, i.e., to a change in the rhythm of anomalies in the different sides of disturbance/breakdown. Logical to assume that the fluctuations in the distribution of the axes of anomalies within the section of oceanic crust, included between the adjacent disturbances/breakdowns, are caused by the random distribution of the places of the introduction of dikes on the axis of median ridge/spine. This testifies about the essential independence of normal spatial distributions of dikes in different sections of the axis of median ridge/spine, although dispersion these of distribution can be equal.

5. Continuity of axial anomaly, confined to riffling valley of Haeckel ridge/spine, in series/run of places is disrupted. Together with the usual cases when riffling valley intersects by faults, the tracking of axial anomaly finds also in some other cases, for

example in those sections of Hakkel ridge/spine where it is grooved valley it takes the form of relatively wide U-shaped basin/depression, but not narrow gorge with the steep/abrupt walls. This complication in the structure of field is logical to connect with the nearness to the pole of the disclosure/expansion of Eurasian basin.



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Fig. 1. Map/chart/card of magnetic anomalies  $(\Delta T)_a$  of the Eurasian basin of Arctic Ocean.

Key: (1). The conventicnal designations. (2). Riffled anomaly.

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The supposedly small (less than 1 cm/yr) speed of the growth of the bottom with the approximation/approach to Laptev shelf in combination with the numerous transverse disturbances/breakdowns by the force of the random mechanism of the introduction of dikes can in the high of

degree distort the configuration of axial anomaly.

6. Structure regularity of field in Eurasian basin is combined with absence of general/universal linear connection/communication between rhythm of anomalies and rhythm of inversions of geomagnetic field. During the selection of the speed of growth on the basis of the standard extrapolated scale of inversions (Heirtzler and oth., 1968), as a rule, it is impossible to achieve the such high conformity of the observed and calculated model anomalies as on other median ridges/spines. Explanation this can be searched for either in the abbreviated/reduced history of the growth of basin (which is reflected in its small width, which does not exceed by 800 km in the studied part), or in the instability of the speeds of growth, either in the increased dispersion of the distribution of the places of the introduction of dikes or finally in the joint effect of these factors.

7. Degree of bilateral symmetry in structure of field of Eurasian basin lower than that which it would be possible to expect, taking into account high latitude position. In a number of cases are observed the systematic and random disturbances/breakdowns of the equidistance of anomalies relative to the axis of ridge/spine (Fig. 2). Systematic deviations can indicate certain difference in the speeds of growth along the different sides from the axis. Probable

deviations, most probable, are caused by random mechanism the introductions of dikes.

Thus, Hakkel ridge/spine, being one of the fragments of the world system of mid-Oceanian ridges (Demenitskaya, Karasik, 1966; moldboard, etc., 1967; Karasik, 1968), is at the same time characterized by a number of special features/peculiarities which first of all are connected with the nearness of this oceanic region to the pole of its disclosure/expansion. Connected with this the low speed of the growth of the bottom in the studied part of Hakkel ridge/spine together with other regional geological factors (relatively small predicted age of basin, presence of the powerful/thick sources of the removal/drift of sedimentary material, supposedly outlying initial position of the axis of the disclosure/expansion of basin relative to Eurasian mainland block/module/unit) caused the appearance of specific features of anomalous magnetic field, which reflect the special features/peculiarities of origin, the histories of development and structure of Eurasian basin.

Equipment of Hakkel ridge/spine with the world system of the active axes of growth makes it necessary with the special attention to relate to the assumptions about the median nature of another largest underwater uplift/rise of Arctic basin - the ridge/spine of

Mendeleyev-Alpha (Johnson, Heezen, 1967; Ostenso, Wold, 1967;  
Demenitskaya, Karasik, 1969).

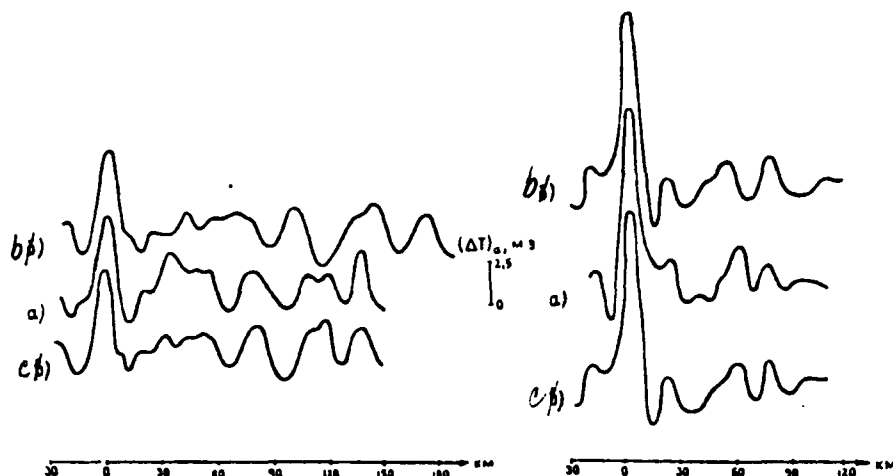


Fig. 2. Bilateral physical symmetry of the profiles of anomalous magnetic field on the rifflid ridge/spine of Hakkel (Arctic Ocean): a) the observed profile, right half; b) the turned observed profile, left half; c) the turned observed profile, left half, after certain correction of horizontal scale.

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The magnetic anomalies of the Eurasian part of this uplift/rise (Mendeleev's ridge/spine) and adjacent basins (submariners, Makarov and SP) are characterized by considerably greater average/mean intensity, than the anomaly of Eurasian basin and Lomonosov ridge/spine. Taking into account the comparability of the calculated depths of the occurrence of sources anomaly in the compared regions, it is possible to connect this difference, first of all, with a sharp

difference in the magnetizability of species/rocks, although the reasons for the latter are not clear.

Magnetic anomalies on Mendeleev ridge/spine and in the adjacent basins are oriented in accordance with the course/strike of Mendeleev ridge/spine and above the latter have noticeably smaller wavelength, than above the basins. Although the appearance of anomalies does not contradict assumption about their oceanic nature, up to now it is not discovered the full/total/complete totality of signs/criteria, which would make it possible with the confidence to carry them to the structure of the field of growth. Attention is drawn to a small degree of the anisotropy of field, caused by the presence of numerous faults. The structure of field can be related to the world inversion sequence of anomalies only under the assumption of the complicated history of growth (including the ancient age of ridge/spine and its contemporary passivity), and also complicated disjunctive tectonics, which destroyed, possibly, the regular structure of field. On the other hand, is not excluded the possibility of equipment of Mendeleev ridge/spine with the microcontinents of the type of those discovered in Indian Ocean.

Latter/last assumption in all probability is completely added to Lomonosov ridge/spine, generatrix the boundary between the Eurasian and Amerasian basins of Arctic Ocean. The elongated magnetic



anomalies of Lomonosov ridge/spine in the average/mean intensity close to the regular anomalies of Eurasian basin are concordant with them in the course/strike, being are strictly parallel to the course/strike of ridge/spine itself. At the same time they are characterized by considerably smaller regularity and somewhat by more complex configuration. Are widespread the transverse disturbances/breakdowns of the structure of field, sometimes which detect connection/communication with the faults which are isolated in the Eurasian basin and in Makarov basin. The sources of anomalies, judging by the calculations, they lie/rest over a wide range of the depths: together with the shallow sources of relatively narrow anomalies during the calculations are discovered the deeply sloping magnetic bodies, moreover with the approximation/approach of ridge/spine to a Eurasian shelf remain only the deeply sloping sources.

This fact in combination with the morphology of magnetic field leads to the conclusion about the monooceanic nature of the anomalies of Lomonosov ridge/spine, which is in full/total/complete agreement with the conclusion about the mainland or sub-mainland crust of ridge/spine (Demenitskaya, etc., 1967; Demenitskaya, Kiselev, 1968).

The elongated submeridional anomalies of Lomonosov ridge/spine do not detect connection/communication with the anomalies of shelf to

the north from the Novosibirsk islands (Demenitskaya, etc., 1964).

The absence of connection/communication of ridge/spine on the magnetic field with the Eurasian shelf and the parallelism of the configurations of the opposite edges of Eurasian basin (i.e. Barents-Kara continental slope and western slope of Lomonosov's ridge/spine) are supplementary arguments in favor of hypothesis about the drift of Lomonosov ridge/spine, which there is no time belonged to the Eurasian mainland block/module/unit, to the side of the north pole (Johnson, Heezen, 1967; Ostenso, Wold, 1967; Karasik, 1968).

Thus, on the present stage of the magnetic study of Arctic basin is established/installed the specific character of the development of three underwater ridges of the Arctic Ocean: ridge/spine, which belongs to the mid-Oceanian type, Lomonosov ridge/spine, which is microcontinent, and Mendeleev ridge/spine, who can relate to one of two types indicated, but, it is more probable, to the first. The resolution of the problems of genesis, development and structure of Arctic basin requires conducting further investigations.

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